

RELATIONSHIPS OF PREDACEOUS BEETLES TO
TROPICAL FOREST WOOD DECAY.
PART I. DESCRIPTIONS OF THE IMMATURE STAGES
OF *EURYCOLEUS MACULARIS* CHEVROLAT
(CARABIDAE: LEBIINI)¹

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ABSTRACT

In preparation for a discussion elsewhere of the natural history of *Eurycoleus macularis* Chevrolat (Carabidae: Lebiini), the immature stages are described, including the egg, 4 larval instars, and pupa. Figures are provided which illustrate the larval habitus (4th instar), dorsal and ventral aspect of head capsule (2nd instar), pygopod (1st instar), and pupa.

INTRODUCTION

During studies of tropical forest wood decay and the role of predaceous beetles in the process, the natural history of *Eurycoleus macularis* Chevrolat was discovered. Repeated observations spanning 3 years allow discussion of that natural history and its ramifications in the evolution of ectoparasitoidism, mimicry, and wood decay. This discussion will appear elsewhere as Part II of the wood decay study. The purpose of this paper is to provide detailed descriptions and illustrations of the immature stages of *E. macularis*.

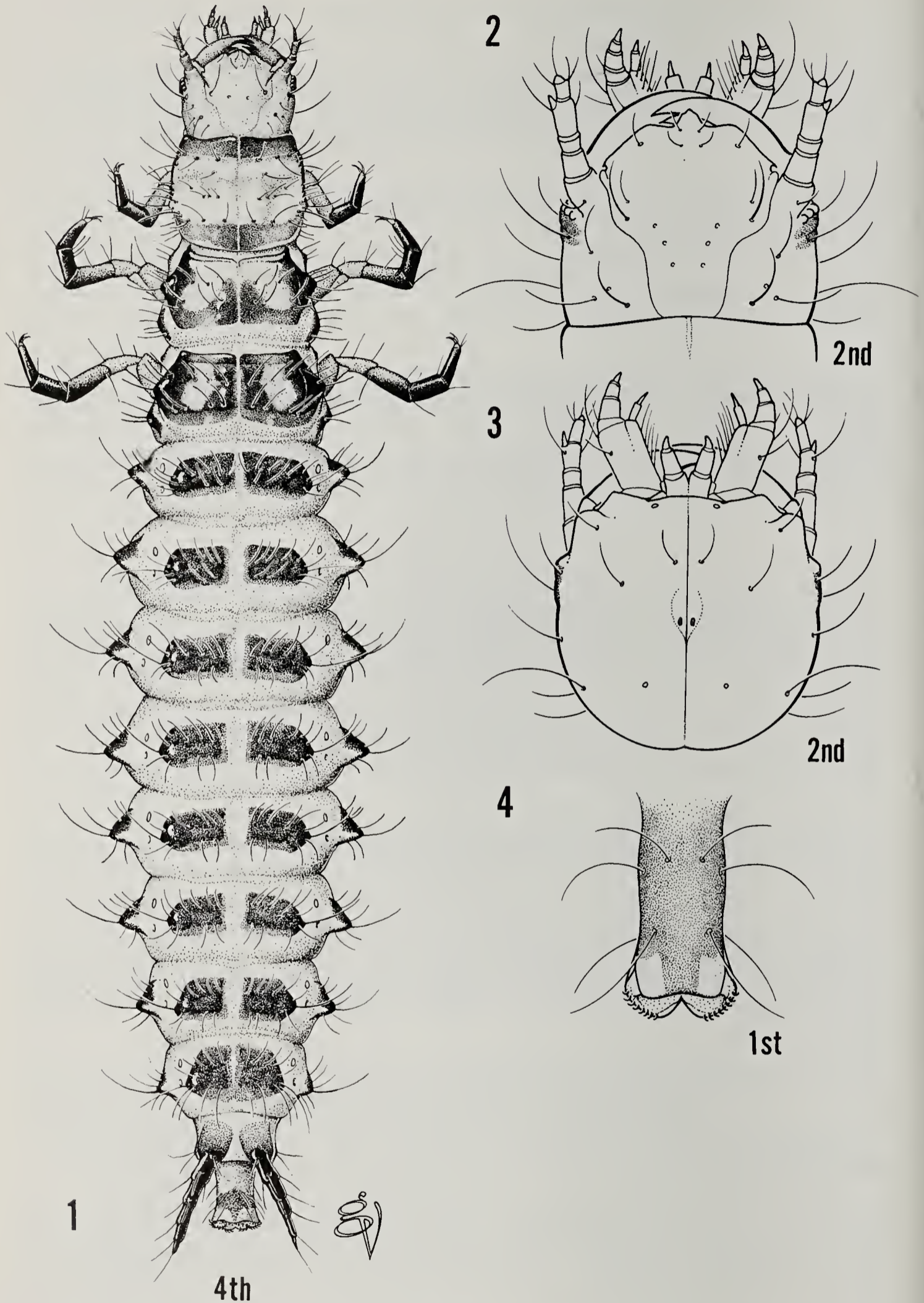
The immature stages of the carabid tribe Lebiini are very poorly known in general, and until now, those of *Eurycoleus* were unknown. In Van Emden's (1942) key to genera of carabid larvae, specimens of *E. macularis* will key to Lebiini, and in the lebiine key, to Coptoderina. Van Emden did not have available enough specimens of Coptoderina, therefore his key is highly inadequate beyond subtribe. Our knowledge of carabid larvae is still sufficiently primitive that no key written today would be adequate. Therefore, I have not attempted to align *Eurycoleus macularis* with Van Emden's key.

IMMATURE STAGES OF *Eurycoleus macularis*

Egg: Size, length (1 specimen) 1.38mm, width 0.60mm. White, elipsoid, with slight acumination at one end. No surface structure visible 120X.

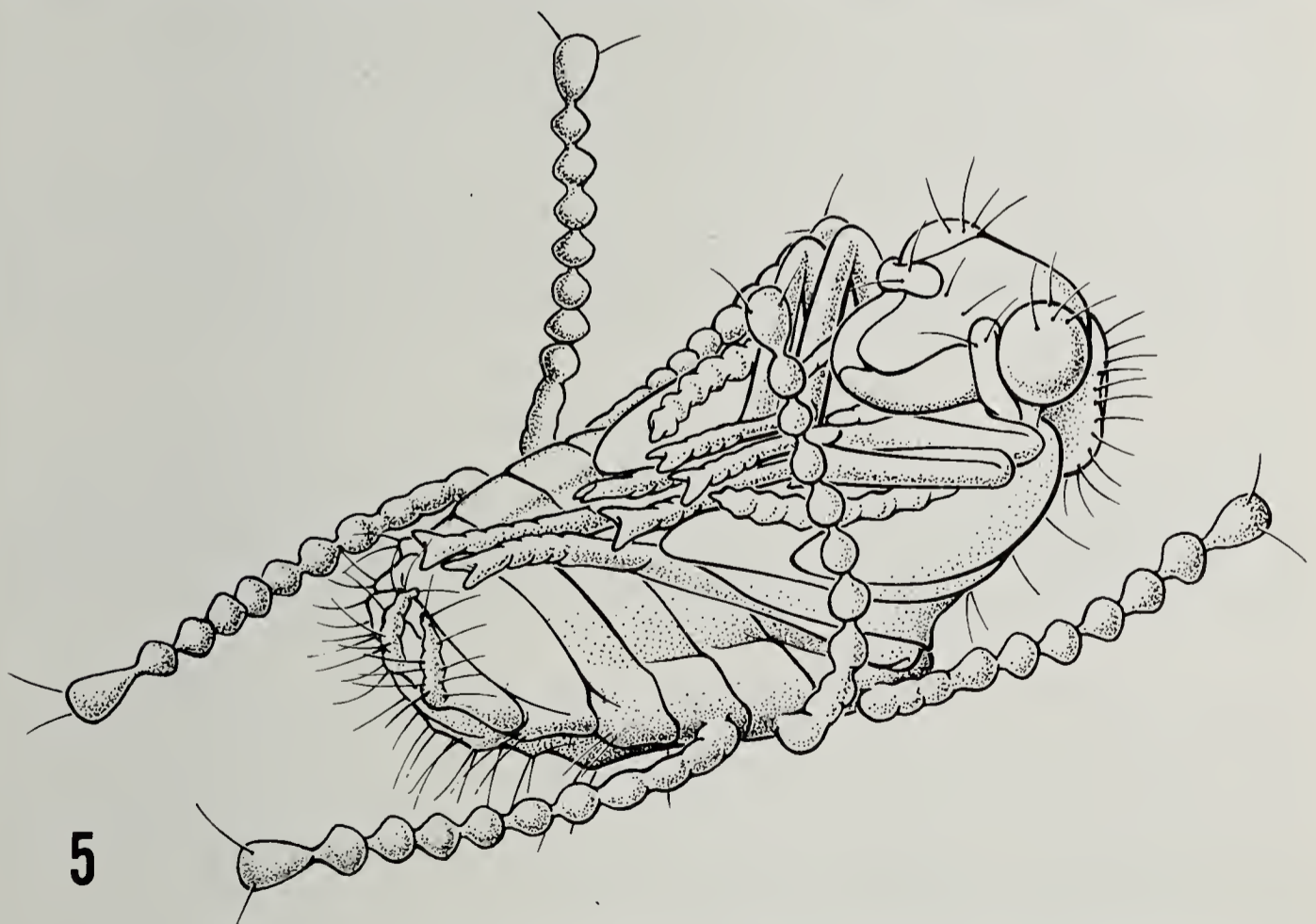
First instar larva (Fig. 4): Total length (1 specimen) 3.5mm, from mandible to apex of urogomphus. Head capsule piceous; antennae, meso- and metathorax, abdominal terga, urogomphi and legs grey; mandibles and palpi yellowish; prothorax, trochanters, and coxae white and strongly con-

¹This study was supported in part by the Walter Rathbone Bacon Scholarship of the Smithsonian Institution through funds provided for field work on wood decay in Central America and in part by the Environmental Sciences Program of the Smithsonian Institution through funds provided for field work on Barro Colorado Island, Canal Zone.



1-4. *Eurycoleus macularis* Chevrolat, all Barro Colorado Island, Canal Zone; 1) fourth larval instar, dorsal aspect; 2) head capsule, second larval instar, dorsal aspect; 3) head capsule, second larval instar, ventral aspect; 4) Pygopod, first larval instar, dorsal aspect.

trasting with rest of body. Setae of various sizes and lengths on various parts of body and head capsule. HEAD: Large, ovoid, depressed, and prognathous. Epicranial suture lyre-shaped (Figure 2). Nasale with large truncate tooth at middle. Front slightly concave between antennal bases. Egg bursters 2, each on elongate carina longitudinally aligned on front between frontal arms of epicranial suture. Cervical region slightly constricted and slightly inserted under pronotum. Mandible broad and flat, sickle-shaped, with large, median, curved tooth and inner edge about one-third the distance from apex; molar region with pensillus; outer margin with single seta near base of curved portion of mandible. Antenna 4-segmented with 3rd and 4th articles apically setiferous, 3rd with 3 long setae, 4th with 3 long setae and several short apical seta-like sensillae. Third article dilated and bearing small transparent bubble apico-laterally. Labium with very small bisetose tubercle-like ligula between 2 small 2-segmented palpi; palpi without setae, sides each with 2 long setae and dorsum with 2 short paramedian setae. Maxillae well developed, each with basal cardo, long robust stipes, 4-segmented palpus and long, 2-segmented mala. Cardo without setae. Stipes with 2 latero-ventral setae, 1 apico-lateral seta, and numerous medial setae. Basal article of mala with 1 ventral seta. Mala two-thirds length of palp. Organs of vision consist of 6 stemmata on each side of head capsule, arrange in 2 verticle rows of 3 stemmata per row. THORAX: Prothorax much narrower than head capsule and about equal to it in length; meso- and metathorax as wide as prothorax and each half as long. LEGS: Long and robust, each with 2 claws of unequal size, the anterior slightly longer and thicker at base. ABDOMEN: 10-segmented, with darkly pigmented terga. Urogomphi fused to segment IX, unjointed, 3-nodose, each node unisetose, apex bisetose. Pygopod well devel-



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5. *Eurycoleus macularis* Chevrolat, pupa, oblique aspect, Barro Colorado Island, Canal Zone.

oped, ended apically with 2 groups of hook-shaped crochets, about 13 in number. Spiracles small, simple, and annular.

Second instar larva (Fig. 2, 3): Total length (1 specimen) 5.5mm, from mandible to apex of urogomphus. Color as in first instar except head and antennae orange, pronotum orange with infuscated anterior and posterior margins, and meso- and metanotum with lateral orange spots. Chaetotaxy as in first instar, setae generally shorter throughout. **HEAD:** As in first instar, except egg bursters absent. **THORAX:** Prothorax as wide as head capsule and partially enclosing it; sides with margins convergent posteriorly, slightly flanged throughout their length; base broadly lobed. Mesothorax as wide as head capsule, half the length of prothorax. Metathorax wider than head capsule, half the length of prothorax. **LEGS AND ABDOMEN** as in 1st instar.

Third instar larva: Total length (2 specimens) 8.1mm, from mandible to apex of urogomphus. All character states and proportions as in 2nd instar except urogomphi multinodose and all colors more intense, orange, black, and white. Abdominal segment IX orange, urogomphi black.

Fourth instar larva (Fig. 1): Total length (5 specimens, and 1 cast skin) 12.5-13.2mm, from mandible to apex of urogomphus. As in 3rd instar. Easily recognized as 4th instar because all other instars have developing setae of subsequent instar showing through the transparent cuticle, whereas 4th instar does not. Pupal setae, if present and seen beneath 4th instar integument, have different arrangement.

Pupa (Fig. 5): Total length (2 specimens and 1 cast skin) 7.0-7.3mm, from crest of head to abdominal apex. Typically caraboid, except abdominal appendages attached laterally to segments II, III, IV. Each appendage of 7 to 9 nodes, apical node of each appendage bisetose. Segment II with appendages directed anteriorly past head; segment III with appendages extended ventrally past most ventral part of pupa; segment IV with appendages extended posteriorly past abdominal apex. All dorsal segments with long stiff setae arranged bilaterally in patches.

MATERIAL EXAMINED: In addition to the numerous specimens photographed and left in the field, or which succumbed to mold or predators in laboratory rearings, there are preserved in the USNM the following: 1 egg; 1, 1st instar; 2, 2nd instars; 3, 3rd instars plus 3 exuvia; 10, 4th instars plus 1 exuvium; 2 pupae plus 1 exuvium.

ACKNOWLEDGMENTS

I thank my wife, LaVerne, for aid in finding *Eurycoleus macularis* larvae, W. Donald Duckworth, Ginter Ekis, and Donald R. Whitehead for reading the manuscript, George L. Venable for the excellent illustrations, and Joan B. Miles for typing the manuscript.

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